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THE NEW ENGLAND Journal of Dentistry.

CONDUCTED BY ASSOCIATED DENTISTS.

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NEW ENGLAND

Journal of Dentistry.

Vol. II. SEPTEMBER, 1883. No. 9.

ORIGINAL COMMUNICATIONS.

A HISTORY OF DENTISTRY.

BY GEORGE H. PERINE, D. D. S., NEW YORK.

[Continued from page 205.]

THE EARLY DAYS OF THE SPECIALTY IN FRANCE.

That to France is due the credit of having made more rapid and direct professional advancement than any of her European neighbors, is a fact which must be conceded from the reference made in the succeeding pages to the immense and valuable improvements in the method of practice, instruments, and valuable contributions to the literature of the specialty which has emanated from the land of the Gauls.

As early as 1580, students in dentistry were admitted to the University of France, though we fail to find any record of the existence of a chair at that time. One has, however, since been established. At the opening of the sixteenth century surgery, although in a somewhat degraded state, began to make some progress toward improvement. The connection of barbers with a science of such importance did not serve to elevate it in the public mind, or to impress with any degree of confidence those unfortunates who were obliged to submit

to operations of a minor character, which were generally performed by barbers or other incompetents. In 1505, however, an improvement was made through a treaty entered into between the physicians of Paris, and the barbers, by which the latter were conditionally admitted members of the faculty, and dignified by the title of "*Tonsores Chirurgici.*"

Later, the surgeons issued a decree compelling the barbers to confine themselves to the performance of only minor operations, but it was not until 1700 that persons desiring to practice the specialty of dentistry were compelled to pass a regular examination. About this time Fanchard (to whom we will refer at length hereafter), writing upon the subject of dentistry, expressed himself as follows:

"The most celebrated surgeons having abandoned this branch of surgery, or having but little cultivated it, their negligence gave rise to a class of persons who, without theoretical knowledge or experience, practiced it at hazard, possessing neither principles or system. Nor does the state of things seem to have been any better in England, while in other parts of Europe it was as bad, or even worse."

URBAIN HEMARD, of Lyons, one of the early French writers, published in 1582 a work entitled "*Researches upon the True Anatomy of the Teeth, their Nature and Properties.*" It was a production of decided merit. In it the question whether the teeth could be considered true bones, and, if not, in what particulars they differed from them, was considered. It also described most accurately the circumstances under which the teeth most rapidly undergo a change, and recommended methods of treatment equally as valuable as those proposed by the dentists of the present day.

AMBROISE PARÉ has been very justly termed by French writers the "Father of Modern Surgery." He was born at Saval, in the Province of the Main, in 1509. He first practiced his profession in the hospitals of Paris, and afterwards in the army, to which he was attached during several Italian campaigns. In 1552 he was appointed Surgeon in Ordinary to King Henry II. He held the same office under three successive monarchs. He was a Protestant, and having rendered great professional service to Charles IX., he was indebted for his life to the friendship of that king, who, on the eve of the horrible massacre of St. Bartholomew, sent for him and secreted him in his private apartments, where he remained during the massacre. He died in 1590. His complete works were published in 1582, and a translation into English of that treating exclusively of surgery was

made by Thos. Johnson and issued from the press in 1634. In his writings, he referred to the transplantation of teeth, and also described several palatine obturators of very ingenious construction. He related an incident of a lady who, having lost a tooth, had it replaced by one extracted from the mouth of her maid. To this practice Parê strongly objected, however, expressing a preference for artificial teeth of ivory or bone, secured by gold or silver attachments. He favored the scarifying of the gums in cases of difficult dentation, and his first experiment of this character was upon his son. He described the teeth as being harder and more solid than other bones, and believed that they continued to grow during life, in favor of which theory he advanced the following argument: "If such were not the case, they would be worn and wasted away by one another through continued use in chewing. This may be perceived by any who have lost one of their teeth, for that which is opposite to it becomes longer than the rest from having nothing to wear it down." Parê was the inventor of several dental instruments much resembling those now in use, and to him the specialty is much indebted for the presentation of many valuable and original ideas; and it was doubtless owing to the beneficial influence exerted upon the profession by him that its advancement became so steady, and its expansion so marked that, within a few years after his death, we find practitioners devoting their attention to particular branches of the science of medicine. The appellation of Surgeon Dentist is for the first time met with in France in 1622, when it was conferred upon Gillies and others, but it was not, however, a title generally recognized for several years thereafter. Gillies was the author of a work entitled "*Remedies for Toothache.*"

In 1633 a similar work appeared. It was entitled "*Remedy against Toothache,*" and the name of its author was Dupont. It advocated the extraction of diseased teeth, and the substitution of those taken from a living or dead subject in their place. Dupont claimed to be the first to transplant teeth, but, as we have previously stated, Parê practiced the method half a century before. Perhaps, however, to Dupont is due the credit of originating as a remedy for toothache the extraction and immediate replacement of the tooth in the socket.

Early in the seventeenth century one Pierre Forrest published a treatise on the teeth, in which he expressed an opinion that the manufacture of artificial teeth from ivory was likely to prove a dangerous blessing. He believed their insertion by means of gold would cause violent inflammation of the gum and other portions of the mouth,

from which the general health of the patient would be likely to be severely affected. For his ability to cure diseases of the maxillary, Forrest was somewhat noted, and he is also credited with having made an improvement in the forceps. Like many of the practitioners of the present day, he possessed a hobby which he persistently rode. He firmly believed that there could be produced a medical compound which would cause the painless expulsion of the teeth from the jaws, and he devoted many years in a vain endeavor to discover this dental philosopher's stone.

Prominent among French dentists at the beginning of the eighteenth century stood Landemiey, of Paris. Indeed, so well established was his reputation that he was chosen to perform operations upon the teeth of Phillip V., of Spain, and in 1723 he was appointed dentist to the king of Spain.

PIERRE FANCHARD, who practiced dentistry in Paris in the eighteenth century, was one of those masters in science whose superior abilities enable them to prepare in the brief space of their active lives works which serve as the basis for much which is performed by those who follow them for several successive generations. He found the dental specialty only a partially developed art, but left it a comparatively well-defined branch of the medical profession. His method of practice can not, of course, be compared to that of the present day, yet it can not be denied that it was conducted upon scientific principles, and was much in advance of his age. Audibran said in reference to him: "It is impossible to explain with more clearness, or to demonstrate with more evidence than did Fanchard, the precepts of an art which partakes at the same time of medicine and surgery." His work, comprising two volumes, and entitled "*The Surgeon Dentist*," appeared first in 1728, and the third and last edition was published in 1786. It was this production which gained for him the title of the Father of Modern Dentistry. Fanchard presented a feasible plan for obviating defects in the palate, and he gave illustrations of no less than five kinds of obturators for this purpose, which are acknowledged to be decided improvements upon those recommended by Parê, and it is generally conceded that the combination of a palate-plate, with artificial teeth, originated with him. To Fanchard is due the credit of exposing the fallacy of the dental worm theory. After a careful examination of the teeth with the microscope, he fearlessly avowed that these creatures had their existence only in the imagination.

In the year 1735 a member of the French Academy discovered

caoutchouc (India rubber), which has since proved a material of great value to the specialty.

The works of Robert Bunon were a decidedly valuable acquisition to dental literature. His "*Prejudices Concerning the Diseases of the Teeth of Pregnant Women*" appeared in Paris, 1759, and "*Diseases of the Teeth*," 1743. Bunon disproved the popular superstition that there was danger attending the extraction of the canine teeth, and explained that their nerves had no connection with the eyes, as had formerly been believed. He was born at Chalons, in 1702, and died at Paris in 1748.

Between the years 1756 and 1764 M. Bourdet, a prominent dentist, published in Paris several works on dentistry. The most valuable of these was entitled: "*Researches and Observations upon Every Part of Dentistry.*" Bourdet was successful in adjusting artificial teeth, and made some valuable improvements in many of the instruments commonly used in his time.

M. Jourdain, a contemporary of Bourdet, contributed to the literature of his profession three able treatises. The first, which was issued in 1761, bore the title of "*A Treatise on the Depositions in the Maxillary Sinus, Fractures and Caries, with Reflections on all Operations of the Art of Dentistry.*" His next was called "*An Essay on the Formation of the Teeth, Compared with that of the Bone*," and appeared in Paris in 1766. His last work comprised two large volumes, and was called "*Treatise on the Diseases and Surgical Operations of the Mouth.*" It was published in 1778, and is still considered a work of considerable practical value. Jourdain's knowledge and rare ability gained for him an elevated professional position, and he was made a member of the College of Surgery.

The first lever for extracting teeth was introduced into practice by De Lesluse, in France, in 1780.

The pen of Delabarre has given to the profession much valuable information. His "*Treatise on the Mechanical Part of the Art of the Dentist*" was published in Paris in 1820. It was in two volumes and, at the time of its issue, conceded to be a work of much merit. Other productions of his appeared between the years 1806–26, and to their author is ascribed the recommendation of rubber as an excellent material from which to manufacture dental plate, and it is claimed that he employed it for that purpose about 1850.

[To be continued.]

EDUCATION.

BY DR. J. A. ROBINSON, JACKSON, MICH.

[Read at the Springfield Union Meeting, June, 1883.]

In your announcement, I see one of the subjects is "Education." Now, there are so many ways to educate people, and we obtain our education through so many different channels, that I thought I would suggest one or two of the various avenues of learning outside of the schools and colleges. I have known a good many well educated men who have had very few advantages in what may be termed school education; they have got their education from nature, through observation and reflection. Elihu Burritt belonged to this class of self-educated men. Daniel Webster was an idler while in college, and he went through with the classics after he removed to Boston and began to have some political aspirations, because he felt the necessity of more book culture. But he had sat for whole days, before that time, under a favorite tree contemplating and studying nature. Patrick Henry, in his youth, spent his time in hunting and fishing until he was called accidentally in court to attend to some business that was so unpopular that those learned in his profession thought it too contemptible to prosecute. But all these days and years he had been receiving instruction from nature, who is the original, the purest and most reliable teacher. Nature is always pure and true, but books are reflections of men's minds, and are often colored by their prejudices and preconceived opinions. Nature's school is always pleasant as well as instructive, and produces the highest development because it is based on reflection. The plays of boyhood quicken the understanding. We learn to overcome the law of gravitation by throwing a ball, and time and space by running a race; and so education through the medium of nature becomes art. The reflective faculties are also the base of all our inventions, they are the thinking properties of the mind forced upon us by our necessities. They make all our improvements in dentistry, they heal all our diseases. They awaken the love of truth, and develop all our heroes and statesmen. It was these that gave us our independence and put down the rebellion. This it is that makes labor conscientious and thorough. Observation is the lever, and reflection the fulcrum that moves the world. Nature is the school-master and the universe the school-room. This combination turns the heroic practice of dentistry into the conservative by love, until we save the natural teeth by the same secret power the Creator exerts when the organs are produced. Next to nature is the associa-

tion and the convention. We arrive at truth in talks and discussions more readily than by reading. The charm of oratory, with the exhibition of appliances, fixes things in our minds as permanently as illustrations in the magazines and newspapers. In meetings like this, we get the combined wisdom and experience of the State. We get at the real things. There is something when we are alone that hinders our coming up to our ideals as rapidly as we do when we commune with minds that are interested in kindred topics. The cold steel of our understanding is warmed by the hammer and flint of our neighbors, as the sculptor and painter is warmed at looking at the perfect models of nature.

The ideal thing is the real thing, after all, and the real man is the man who conforms to what he calls his ideal, and the ideal is the real that was before he realized the fact. The ideal tooth grows out of the fact that there is a real tooth, and the perfect artificial denture grows out of the fact that there is a perfect denture. The perfect fillings we see to-day grow out of the fact that such men as Harwood and Tucker and Bemis and Hudson have lived and left real examples of beauty and excellence as ideals for us to follow. So the ideals are always the reals that precede us. What one man has done another man may do by imitation, and we all imitate nature—not, perhaps, every man, but some man. Our ideal possibilities are because some real thing has been made possible. So, when we mention the names of our distinguished men and honor them, we honor ourselves because we honor our possibilities. When we see a really great man, we say this is our possibility; this is what we are as a divine whole. So, in conventions, when we talk of those who gave their lives to their profession and have passed on—when we contemplate their lives and labor performed and success achieved, we see our real selves in their ideals or reals they have left us, as those who shall come after us will see themselves in what we are doing here to-day.

Very few great men live to see their true greatness, there are so many obstructions to overcome in every profession. One of the greatest is professional jealousy. Jealousy is a crooked road that leads us through thorns and briers of deceit and dissimulation to the uncomfortable throne of malice and hate. This grows partly out of the fact that the world is exacting so much of those who follow professional life that we cannot live our true selves. We feel obliged to turn toil and genius into money, to keep pace with the demands that are laid upon us. When we do turn toil and genius into money, we

always give a fair exchange, for the good dentist can never be in debt to his patrons; he always gives more than he receives. The trouble is, that we cannot fathom the greatest depths of genius while we are in poverty. When a personality is marred and defaced, the person who can restore it can never be overpaid. The man of genius can never be satisfied with the mere utilitarian things of this life. Then our present civilization demands something higher than food and clothing. We could not do our best under such circumstances. The soul that is satisfied with a *stand still* does not deserve our affection. We should have had no America if Columbus had had no ideal,—and the real America existed ages before Columbus contemplated his voyage; but his soul saw the continent, and was never satisfied until his eyes rested on the green hills of the Bermudas. Columbus was willing to sacrifice his life for his ideal. In the lower orders of creation, there is no such jealousy existing as between the animal creation. Where there is no ideal there can be no progress. The daffodil, the tulip, and the snow-drop remain the same through the ages. The tulip comes without jealousy to cheer us in the spring-time, and the snow-drop remains to give us hope and courage for the winter. This *jealousy* grows out of intensified selfishness and false reasoning on the principles of political economy. When the world has learned that the supply of a thing makes the demand for a thing, and not the demand a supply, and that the supply, like the real, must always come *first*, they will walk more in harmony with each other. The supply of good dentistry makes the demand for the good dentist, as much as the supply of good dental materials makes the demand for them. It is the same in all the improved implements of industry and machinery —the mowing and sewing machines, and tools of trade, including money. When the new improvement first comes it may jostle and disturb the old for a time; but the survival of the fittest is the great law in nature, and the expansive nature of our civilization, and the increase of our population, and the laws of business gravitation will restore harmony in society and always keep pace with our wants and real needs.

The difference between the educated and uneducated portion of humanity is fully illustrated by a view of Franklin Square, New York. Take the outside street in front of Harpers' Publishing House and compare it with the inside. Let us see what we find outside. We find the rag-picker hooking up a dirty piece of rag, blended in the common filth of the street. It has no significance above the pennies

it will bring to sustain life; but the person who is inside, and the paper-maker, look beyond the filthy rag, and see it made into paper as pure and white as the snow, and the name of God and Immortality written upon it. Alas! how many rag-picker dentists there are abroad in the land—dentists who see nothing higher than tooth extraction, and rubber plates and amalgam fillings, and the few pennies that lay behind them to keep them from starvation. This rag-picker is raised only a step above a vegetable life; but the paper-maker and the book-maker see something infinitely higher and grander in the transformation of the rag into paper and books. They see in the dirty rag the alphabet teaching the child to read, and anon it is teaching chemistry, and history, and philosophy. They see it going on a mission to foreign lands, and giving us our constitution and laws. They see it measuring the crust of the earth, and giving us the psalms and the psaltery. They see it recording deeds and possessions that make us vain and proud, but which no more compare to real deeds of kindness and benevolence than the faintest glimmer of a single star to the blazing glory of the sun. They see by the eye of faith in that dirty piece of rag, and in the rag-picker also, a transformation and resurrection almost as great as that recorded in the New Testament, where it tells of the souls of those that are washed in the river of life and made fit to dwell with the angels and God forever. Nature is constantly impressing us with her invisible forces, only of a different order, like the invisible forces that grow the plants and the flowers; but we must not forget that these forces are *real* forces, for how can anything be impressed without something to impress it? or how can impressions be made without there is something to impress? Nature impresses herself on those whose natures are so supple that they can receive and retain impressions. Nature is one vast stereoscope, and everything we realize is daguerreotyped upon the mind. We sit musing within ourselves, and call it thought, when, in fact, we are only looking at impressions indelibly stamped upon us by this invisible hand of nature years before we could appreciate its meaning, or had mental culture enough to understand its significance. We can sit in our homes a thousand miles away and see the village where we were born. We can see the very house and the furniture, and the well; we can see all the cattle on the farm, that have been dead for more than fifty years; we can see the old stage coach that gave place to railroads long years ago—see the familiar face of the driver, and hear the veritable crack of his whip, and see the sort of magic twitch of the arm

that produced the sound; we can see the gray hairs of our father blown by the wind as he drew water from the well; and our dear old mother, with a clean white apron, standing at the churn, or making a cake for the boys, and hear the very crackling of the brush in the oven, and almost feel the impatience at its dullness of heat so that the cake could be baked and eaten; we can see all the little girls we loved when we were a boy, and feel all our little disappointments over again, as we turn over this stereoscope of the mind on which they are indelibly printed. These retrospective happinesses were once real happinesses and ideal remembrances, because they were real once; and the ideal always looks towards improvement. The person who is thoroughly satisfied, is a sort of Rip Van Winkle fellow, and is either just asleep or fast going to sleep. The visionary man is better than the stand-still man. He may be an adventurer, but the adventurers are looking toward the new, and their minds are never satisfied. They have received impressions from the far away and are called prophets. They are the persons who build railroads, and towns, and cities for humanity to people a continent.

Such persons are always educated persons, though they may have never seen the inside of the school-room. They behold afar off all the reals, and baptize them with the name of ideals. We can never reach ideals by compromises; the ideal compromise never makes real progress; they improve sometimes upon the thoroughly bad, but cannot reach perfection. Nothing that *will do*, but which you wish you had done better, can ever fill the perfect ideal, because it has not before it the real. It is just the same with the educated dentist.

Our ideal civilization is only that civilization that corresponds nearest to that real civilization laid down in the New Testament and illustrated by the real life of Jesus. The ideal light is the real light of the sun. It was first imitated by man in burning the pine knot and the bon-fire, that gradually grew to the tallow candle, and from thence to kerosene and gas; and finally to the electric light. And the ideal life is only a correspondence to the real life that is within us. This real life that we call the ideal life thrusts aside all abuses, takes all the poisons, and administers them to our health, and actually saves teeth without extraction till death; supplies artificial dentures that are harmless, that come within the reach of all the unfortunate, and so come nearest the divine. The real is within us, or we could not catch a glimpse of the ideal, and it is by this mode of reasoning, which is logical and not sophistical, that we reach over the river and take hold of the immortal life and the real hand of the Infinite Father.

INSTRUMENT MAKING.

BY DR. C. F. BLIVEN, WORCESTER, MASS.

[Read before the Massachusetts and Connecticut Valley Dental Societies, at Springfield, Mass., June, 1883.]

Instrument making appears to have become a source of great profit to those engaged in it. They appear to be striving to outdo each other in producing articles for which they can demand a ready sale, utterly regardless of their practicability. It is often remarked by those engaged in this pursuit, that the dentist cannot afford to make his own instruments. This may be true of those who lack the knowledge and skill to do so and who can purchase just what they desire.

Following in the footsteps of our predecessors deprives us of progression; to advance in our profession, the dentist must invent his own theories and organize his own systems; to enable him to perfect his original methods he must possess the skill to produce by his own labor the necessary instruments and appliances. How many offices are there free from a large collection of articles never used, many of them the result of excellent ideas that require only the skill of a practical dentist to make of them valuable assistants. The fortunate possessor of skill will make few purchases of *useless* articles, even if he is assured by the gentlemanly salesman "that it is strongly recommended by Dr. —— as the only successful appliance ever sold." After several unsuccessful trials, it is given up in disgust by the unfortunate purchaser who again returns to his former method of practice, or takes it upon himself to study out an idea and, if he constructs only a portion of it, by giving his personal attention to its detail, he finds it a successful and economical experiment. As good an illustration as I am able to give, is my own experience with the flexible drills, introduced by Dr. E. Palmley Brown,—an excellent idea, worthy of being executed with greater care and skill by the manufacturer. Many of the same number are so variable that no reliance can be placed upon their size in ordering them; only one of what may be supposed to be No. 3 proved of any value; in fine, only one instrument out of five proved of any value—too much temper in one, too little in another, and flaws in the remaining two, proved them failures, after two or three trials each.

The two I exhibit here were made in about an hour and have become old veterans in service, receiving many wounds and much abuse—from patients principally—but appear to possess vitality and

strength for many more months of usefulness! After my experience with these and many other devices I find it more economical to make whatever I possess the skill to construct. One should not, however, become bigoted, but accept any device they may be able to comprehend, considering the patient's comfort, time saved, and its practicability.

The Dental case once well supplied, it takes only a few hours each month to keep up its standard. With a little experience and a proper outfit—the cost of which need not exceed twelve or fifteen dollars—it is surprising how easily and quickly many things are accomplished.

While I prefer a bituminous and charcoal fire when it can be used, gas is more convenient for small instruments, but makes steel hard and brittle; it is claimed by many that gas has no detrimental influence upon that portion of the steel the flame is in contact with, but that it has upon the part heated beyond the flame. There may be something in this, for springs brazed together never break at the brazing, but at a point a short distance either side of it and apparently the portion heated *by*, but not directly *in*, the flame.

It is of the greatest importance that a grade of steel be selected best suited to the purpose it is designed; and for instruments one that is strong, dense and will not take a fine temper is requisite. Jessup's steel works easily and runs more evenly than Stubb's, but will not hold an edge as well on fine instruments. The Sheffield razor steel is far more suitable for excavators and chisels than any other I have been able to obtain. Crome steel, noted for its great strength, has been highly recommended to me by the President of the Company who manufactures it, but it cannot be obtained except by special order in bars small enough for instruments. It is also said of this steel that it is not injured by over-heating. This, together with its strength, are certainly two very strong points in its favor.

It is nearly impossible to forge some of the smaller instruments while red hot; there is, however, very little danger of breakage if done upon a very hot anvil, striking rapidly the least number of blows necessary to form it into the required shape. A little extra filing is preferable to heating and hammering too frequently. When the shape is obtained, the instrument should be draw-filed and sharpened before it is tempered. A knowledge of tempering can only be obtained by close observation and experience. As one must be governed wholly by the purpose for which the instrument is designed, numerous experiments have convinced me that for general use there is nothing better

than a saturated solution of chloride of sodium (to which a little flour may be added), heated to a temperature of about 65° Fah. The instrument should be warmed and dipped in the liquid, previous to heating to a cherry red,—and that degree of heat maintained until the salt and flour are melted. It must then be plunged instantly into the preparation; for instance: The instrument may be held in the flame at an angle, and a long large-mouthed bottle filled with the solution raised quickly up to it, moving it away as soon as the point of the instrument is in the solution. This method prevents the air from coming in contact with it and if properly done will come out white as far as the instrument is hardened. One or more sides of it must be polished with emery-cloth if the temper is to be drawn upon hot iron. This may be omitted where several are to be drawn at once, in which case several may be bound together and suspended in mercury, heated to a temperature that will draw them to the temper required. No time must be lost in removing them from the mercury and plunging them into the bath; for this purpose water heated to the temperature previously mentioned is to be prepared, as it leaves the instruments in a cleaner condition for finishing. This may be handily accomplished by placing them firmly in a vice and drawing around them strips of emery-cloth from one fourth to one inch in width upon which a few drops of oil are placed, removing the file-marks with No. 2 and following with No. ½, 0 and 00 emery-cloth, completing the finish with oiled crocus-cloth. A higher polish may be obtained with rouge, but it is of no practical advantage, as it soon disappears after using the instrument.

Nearly every dentist's laboratory contains the necessary outfit, with perhaps a few necessary additions. The burner exhibited is the best I have ever seen, not only for instrument-making but for general laboratory use; it is adjustable, sold at a reasonable price and may be obtained of H. C. Earle of Worcester. When properly adjusted and surrounded with a cone made of fire-clay and bran, a piece of steel one-fourth of an inch in diameter may be heated to a cherry red, in a few moments, to the length of four or five inches. A tin-smith's furnace with proper dampers, where a strong draft can be obtained, is an excellent and inexpensive forge; it may also be used as a stove in small laboratories, and for other purposes. Two hammers are required, one having a round and one a flat face, together with two anvils, one 1½ x 4 inches, the other ½ or ¾ of an inch square, with one round and one square stake. An excellent anvil for the larger size would be one

with a hole in its center, about three-fourths of an inch in diameter, as this would bring the fire and work to its nearest proximity and aid in keeping both hot. A set of Grobet's die-files, smooth cut, with a 7-inch half-round second cut, a 12-inch flat smooth, a 7-inch equalling smooth, 6-inch narrow pillow smooth, 6-inch half-round smooth, 3-inch half-round smooth, and a 3-inch half-round dead smooth, constitute a very desirable set.

Instrument manufacturers are very reluctant to furnish serrating files or give information where they can be obtained. They can be purchased, together with the steel of any grade or size, of Peter Frassé, No. 95 Fulton street, New York.

EDITORIAL.

THE AMERICAN DENTAL ASSOCIATION.

Being unable to attend the annual meeting of the American Dental Association for 1883, held at Niagara Falls on the 7th, 8th and 9th of August, and having at our disposal—by the mistaken policy of the Association—but a meagre report of the proceedings, we are not able to give our readers the advantage of an early report. From various sources we learn that the meeting was largely attended and possessed many features of interest; in short, that it was a "good meeting."

By a "mistaken policy" we refer to the "exclusive right" which the Association claims to all the papers read before it, denying to any journal the privilege of printing the same, or to the author thereof offering the same for publication, until it appears in the tardy proceedings of the Association's publication. Could the proceedings be edited and issued before they became stale, this objection would not seem so self-evident as is the case in the past history of such publications; but, by the time such reports are usually issued, other things have arisen which demand the attention of the average editor and the profession as well. The profession generally having learned through indefinite and unreliable sources, in the meantime, some *half-truths* regarding the meeting, have not the disposition to undertake the careful perusal of the voluminous proceedings when, some months afterward, they come to hand. Fresher material is at hand. Thus it is that the profession at large probably are less acquainted with the work

of the American Dental Association—in detail at least—than almost any other society in the land. Very few, indeed, but members, ever see the Association's publication, and, for the reasons given, the journals simply *cull* a report at best. As at present conducted, the publication is of interest chiefly to members, when, if live journals were permitted free access to the papers and discussions, the impress and influence of the Association would be much more potent and widespread. Some interesting resolutions were passed, of which we give the following:

Dr. Peirce offered the following, which was received with applause and unanimously adopted:

Resolved, That the American Dental Association deems it adverse to the interests of the dental profession for any State Board of Examiners to confer a title or degree of any nature.

. . . . . .

Resolved, That the interests of the profession and advanced dental education both demand that all dental educational institutions shall require that every student, before being admitted to examination for the degree of doctor of dental surgery, shall have taken two full courses of lectures.

This resolution caused a lively discussion, in which Dr. W. C. Barrett, Dr. Stockton, Dr. Buckingham, Dr. Pierce, Dr. B. G. Marklein of Wisconsin and Dr. Allport of Chicago participated. The resolution was unanimously adopted.

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IN MEMORIAM.

The chair of our president is draped with the insignia of grief and mourning, indicating that its proper occupant is not with us, and that this Association has met with bereavement.

Dr. William H. Goddard, president of this Association, is no more. He died at his home in the city of Louisville on the morning of March 4, 1883, after a prolonged illness and great suffering.

Aside from the fact that it is the first officer of this Association whose loss we mourn, the character of our friend and colleague—as a man—was such that this Association simply honors itself by giving expression to its feelings of sincere and heartfelt sorrow at his death, profound respect for and appreciation of his many noble traits of character. He was the personification of honor and integrity; conscientious and exact—even to apparent sternness—in the fulfillment of duties either assigned to him or voluntarily assumed; modest and

unpretending in all his stations of life, yet possessed of that manly independence of thought and opinions which enabled him to become on important occasions a valuable counselor. Among his peers he was positive and strong in asserting his convictions, yet never in an arrogant or overbearing manner. In his exterior, our friend was not endowed by nature with that smooth and polished suavity of manner and address which attracts and charms at first sight, yet his excellence and strength of character soon won for him friends and honor. With all his apparent sternness of manner, he was at heart exceedingly kind and gentle. Honors came to him unsought, and whatever stations of life he occupied, or trusts administered, he was honest and faithful. His death is mourned by many who have lost in him a guardian, trustee, adviser, or friend. In his family circle and among his more intimate friends, he was kind and affectionate. He was at times quite humorous, and enjoyed an innocent practical joke right well.

We all know what he was to the American Dental Association. For fourteen successive years its treasurer, until finally called forth to take the gavel and be its president, many of us have reason to remember him as an impartial but exact and unflinching officer. In his profession he strove to be abreast of the times. There was no standing still or retrograde movement with him. He was always up and doing. His career in life has been an interesting and beautiful one. It would furnish material for an extended obituary that has been written by able and loving friends and nothing that might be said here would be needed. In token of our affectionate regard for our departed frater, let a page of our records receive this our memorial, and the expression of the sincerest sorrow of this Association at his demise. Let his widow and family receive the assurance of our sympathy and condolence with them in their bereavement and distress, and our best wishes for their future welfare.

J. Taft,
F. H. Rehwinkel,
G. W. McElhaney,
Committee.

On motion of Dr. McKellop, of St. Louis, it was voted to inscribe the resolutions upon a memorial page in the transactions, and to send a copy to the family of the late Dr. Goddard. The vote was taken by rising.

Resolutions were also passed relating to the deaths of Drs. M. H. Webb and Wm. H. Allen.

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Dr. Pierce, chairman of the committee on place of next meeting, reported Washington, St. Louis and Saratoga. The Association proceeded to select the place by ballot. On the second ballot Saratoga was chosen, receiving twenty-nine out of fifty-four votes. The following officers were then elected:

President—Dr. E. T. Darby, Philadelphia.

First Vice-President—Dr. C. S. Stockton, New Jersey.

Second Vice-President—Dr. T. F. Moore, South Carolina.

Corresponding Secretary—Dr. A. W. Harlam, Chicago.

Recording Secretary—Dr. George H. Cushing, Chicago.

Treasurer—Dr. George W. Keeley, Ohio.

Executive Committee—Drs. A. G. Friedrick, New Orleans; S. G. Perry, New York; W. N. Morrison, St. Louis.

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At the meeting of the National Association of State Dental Examiners, held Tuesday afternoon in the Cataract House, the time and place of next meeting was left to be fixed by the officers of the Association, and a cordial and earnest invitation was extended to all state boards to join this Association and co-operate in its work. The transactions of this session will be published and furnished to the various state boards. A draft of a law was made to be recommended to the various state societies desiring to secure such legislation, embodying the features which experience has demonstrated are most essential. These features are that the board should be appointed by the governor of the state from candidates furnished him by the state dental society; that there should be a perfect system of registration, and that the violation of the law should be deemed a misdemeanor punishable by a fine of not less than fifty dollars nor more than two hundred, or confinement for six months in the county jail.

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The report of the prize committee read, as follows: "Your committee to whom was assigned the duty of deciding upon the merits of essays upon 'The Etiology of Dental Caries,' offered for a prize of $200, which was last year appropriated by this Association for the purpose, would respectfully report that but one essay has been received, and that from the hands of Dr. W. D. Miller, Berlin, Germany. The committee have carefully read this, and while the views contained therein are not original, many of his experiments, which are in detail and made for the purpose of confirming his theory, have not been previously published. Your committee would, therefore, in view of

the original work which the author has prosecuted the past two years, the results of which are given in the paper, award to the essayist the $200 appropriated for the purpose."

We are informed that the report of the "prize committee" was, after considerable discussion, adopted, with only a single dissenting vote and when a full delegation was present. We are also informed that on the last day of the meeting, when only about twenty members were present, this vote accepting the report was reconsidered and the recommendation of the committee was rejected. We are not informed as to the reasons assigned for this action, but on general principles this action has on its face a "*bad look.*" Some very potent reasons must be presented before a minority can thus at the close of a meeting, in the absence of the majority, undo the work of a preceding session without laying themselves open to a charge of at least unmanly unfairness, if not to something more reprehensible. It is exceedingly difficult to conceive of a case that may warrant such action. If we correctly understand the facts, the conviction can hardly be resisted that there is "bad blood" somewhere that will react upon the unfortunate possessors, sooner or later, in a manner not entirely to their professional credit, or honor as gentlemen. We only hope that we misunderstand the case.

A VARIETY OF LEPTOTHRIX DISCOVERED BY DR. W. D. MILLER, AND NAMED BY HIM LEPTOTHRIX GIGANTEA.

Dr. Miller had the kindness to send us a copy of the *Berichte Der Deutchen Botanischen Gesellschaft* containing a monograph about this parasite; we give an abridged translation.

"In summer last year, Dr. Möller of the veterinary school at Berlin brought to me a dog suffering from Riggs' disease (pyorrhœa alveolaris), to have its teeth examined. On the scum covering the teeth there was a luxuriant development of a *spaltpilz* of gigantic dimensions, which was recognized in the course of the investigations as a new variety, and named leptothrix gigantea. The next question was if this organism did not also occur in the teeth of the carnivorous or phytophagous mamals, and this induced me to investigate their teeth in this direction, and I found that this fungus existed also in the mouths of sheep, cattle, hogs and horses.

The fungus appears usually in the shape of tufts or patches whose threads, similar to those of crenothrix, spread in different directions

from their point of attachment. The appearance in patches seems to be due to the fact that such little groups of threads are developed from little lumps of cocci. I have seen that in the plainest manner in the scum of teeth from the mouth of a cat. One sees a little lump of round and oval cocci from which threads of varied length radiate in all directions. The older ones are segmented into bacilli and cocci, so that there can be no doubt of a connection between these three forms. The threads of some patches vary considerable in thickness, in a similar manner as perhaps crenothrix or beggiatoa. Some are very thin, others quite thick, and there are all transitions between these two. In the finer threads no difference of basis or top can be observed, but this is well marked in the larger ones. The threads are sometimes straight, sometimes bent, and often quite regularly coiled; two or three are sometimes coiled together. In all those points leptothrix gigantea resembles beggiatoa alba and crenothrix Kühniana. Segmentation may be observed sometimes in all the threads of some patches. As in leptothrix bucalis, the threads are very often segmented into bacilli and micrococci. All these could be seen without the use of re-agents in larger threads, mainly in the upper and middle parts. Very thin threads show the segmentation already very beautifully while alive, but to see them in the finest threads, staining substances have to be employed. Sometimes one can see all three forms in the same thread, transitions of bacilli to micrococci, but finally all is resolved into cocci. In the threads carrying partitions, the components, may they be bacilli or cocci, are discharged from them and collect in little heaps.

It is a special feature, chiefly of large threads, that the components show deviations from the older forms. The bacilli and cocci often swell up and become rounded so as to press against each other. Sometimes the bacilli swell to pear shape or, when touching the neighboring cell, develop bag-like excrescences. In the older threads one can observe how the bacilli lying originally in one row, somehow become displaced, so that they no longer coincide with the axis of the thread. If now the bacilli grow in the new direction, they grow side by side, and in consequence of this occurrence the thread, which was originally uniform, appears more or less strikingly broken. We have seen that the form of cocci may originate in the first part by transverse segmentation. If such segmentations occur in small threads, the cocci show of course very small diameters; but if they occur in large threads the diameter is much larger, too. From the large cocci by

progressive divisions smaller cocci may be produced. This could best be observed in the form of leptothrix gigantea that occasionally occurs in the teeth of pigs. There occurs in the first place a transverse segmentation of a large coccus so that this is divided into two disks, but then every disk is divided lengthwise, so that the originally large coccus is divided by divisions in two directions of the space into four smaller ones. Sometimes such a formation can be seen for the whole length of a thread. At the beginning cube-shaped, those cocci afterwards become loose and move so that the original shape becomes obliterated. These divisions in two directions can often be proved only by the use of staining materials.

The spiral form occurs in the larger and smaller threads in the three modifications of spirillium, vibrio, and spirochæte. All transitions from spirillium to vibrio, and from vibrio to spirochæte, can sometimes be seen on the same thread. Very often these spiral forms show no trace of segmentation, and only by the use of staining materials can the divisions be made visible.

I presume that the fine forms of spirilla found on the scum covering the teeth in man, which has been designated until now as *spirochæte dentium*, might originate by segmentation of long threads.

Spirochæte dentium has been considered until now to be a unicellular structure, and although I took the greatest possible pains, I could not discover any segmentation in bacilli and cocci, but by applying the method of W. Zopf, I have been able to prove beyond doubt the segmentation in parts of unequal size. These pieces agree in size and shape exactly with the "dental bacterium" as observed in the mouth. To prove this segmentation, the strongest lenses with oil immersion and Abbe's illumination are needed. The specimen ought not to be colored very intensively."

A great number of very fine drawings accompany the excellent monograph.

Among our new advertisements this month we would call special attention to Dr. Waters's Electro Magnetic Flesh Brush. A personal trial of the brush satisfies us that it has merit, and we can recommend it without any reservation, mental or otherwise.

DRILLS.

Harden well your drills, chiefly the finest points of them. If the drill is well tempered, you can give a very fine edge, and if the cutting edge is arranged according to good mechanical principles, a well-hardened drill, moistened with oil of turpentine, will cut through glass with the same ease as through sheet iron. By the way, has any one tried to cut enamel with a drill moistened with a little oil of turpentine? We should think, if properly managed, it would cut much better, and with far less pressure and pain. A fine scientific arrangement of the drill point is of more importance than one might think at first sight of such a little bit of matter. Then think about the chips! Where ought they to go? You cannot cut well if you do not provide ample means for the chips to pass by the drill. Many of those flat, blunt-pointed drills not only do not cut well, but what they cut they do not remove, and thus operator and patients are annoyed. It ought to be a pride for every dentist to have a large supply of the most refined, intelligent and trained drills into which he has put more wit than into his dull brutal pluggers. Also burs, it seems to us, are often neglected from their not being kept sharp in a proper manner. A little delay in proper sharpening more than pays in the saving of time and annoyance.

SOMETHING ABOUT SMOOTHNESS OF DENTAL PLATES.

All kinds of theories have been advanced to account for the various effects of rubber plates, plates of celluloid or metal on the mucous membrane of the mouth. Several factors contribute to these disagreeable effects: The non-conductivity of the materials, the silver and mercury they contain, but far more still, as it seems to me, the defective smoothness of rubber and celluloid plates which renders them so hurtful. We all are familiar with the fact that, whenever two parts in the body touch and move upon each other, they are of extreme smoothness; in fact, so smooth, that it is very difficult for us to produce anything similar; I only draw attention to the cartilage of the bones and the outer surface of the eye-ball. With people who are forced to use artificial eyes, it has been found that these artificial eyes—though made of glass, the hardest and smoothest substance we can produce by a simple process—have become too rough for the eye-lids after only two years' wear. The liquids of the eye, the ammoniacial and saline secretions, together with the continuous move-

ments of the eye-lids, produce a superficial abrasion and roughness, even of this very hard and smooth material, so as to render it an injurious body to the eye-lids. The very same thing is important in dental plates. Why do plates lined with metal prove less injurious than simple rubber plates?

When at the Cincinnati Convention last year, Dr. Robinson, of Jackson, Mich., mentioned the good results he obtained from rubber plates lined with his soft, fibrous foil. I thought that the heat-conducting theory could not be made to agree with this fact. I was convinced from this and other facts that there was more than the heat-conducting power which comes into play, and this factor I think is to be found in the defective smoothness of the ordinary rubber plates. Metal can be polished much smoother than rubber and celluloid, and the smoothness of metal plates that are not oxidized is not impaired as rapidly as that of rubber or celluloid. Therefore, make your plates very smooth, either by covering them with some metallic lining, or by plating them with silver, gold, or anything of the kind, or by using metal altogether. M.

SELECTIONS.

THE GERM THEORY OF DISEASE.

BY PROFESSOR H. GRADLE, M. D.

[A Lecture delivered before the Chicago Philosophical Society, November 4, 1882.]

Scourges of the human race and diseases are attributed by savages to the influence of evil spirits. Extremes often meet. What human intelligence suspected in its first dawn has been verified by human intelligence in its highest development. Again, we have come to the belief of evil spirits in disease, but these destroyers have now assumed a tangible shape. Instead of the mere passive, unwitting efforts with which we have hitherto resisted them, we now begin to fight them in their own domain with all the resources of our intellect. For they are no longer invisible creatures of our own imagination, but with that omnipotent instrument, the microscope, we can see and identify them as living beings, of dimensions on the present verge of visibility. The study of these minute foes constitutes the germ theory.

This germ theory of disease is rising to such importance in medical

discussions that it cannot be ignored by that part of the laity who aspire to a fair general information. For it has substituted a tangible reality for idle speculation and superstition so current formerly in the branch of medical science treating of the causes of disease. Formerly —that is, within a period scarcely over now—the first cause invoked to explain the origin of many diseases was the vague and much-abused bugbear, "cold." When that failed, obscure chemical changes, of which no one knew anything definitely, or "impurities of the blood," a term of similar accuracy and convenience, were accused, while with regard to contagious diseases medical ignorance concealed itself by the invocation of a "genus epidemicus." The germ theory, as far as it is applicable, does away with all these obscurities. It points out the way to investigate the causes of disease with the same spirit of inquiry with which we investigate all other occurrences in nature. In the light of the germ theory, disease is a *struggle for existence between the parts of the organism and some parasite invading it.* From this point of view, diseases become a part of the Darwinian programme of nature.

The animal body may be compared to a vast colony, consisting as it does of a mass of cells, the ultimate elements of life. Each tissue, be it bone, muscle, liver, or brain, is made up of cells of its own kind, peculiar to and characteristic of the tissue. Each cell represents an element living by itself, but capable of continuing its life only by the aid it gets from other cells. By means of the blood-vessels and the nervous system, the different cells of the body are put into a state of mutual connection and dependence. The animal system resembles in this way a republic, in which each citizen depends upon others for protection, subsistence and the supply of the requisites of daily life. Accustomed as each citizen is to this mutual interdependence, he could not exist without it. Each citizen of this animal colony, each cell, can thrive only as long as the conditions persist to which it is adapted. These conditions comprise the proper supply of food and oxygen, the necessary removal of the waste products formed by the chemical activity of all parts of the body, the protection against external mechanical forces and temperature, as well as a number of minor details. Any interference with these conditions of life impairs the normal activity of the entire body, or, as the case may be, of the individual cells concerned. But the animal system possesses the means of resisting damaging influences. Death or inactivity of one or a few citizens does not disable the state. The body is not such a

rigid piece of mechanism that the breakage of one wheel can arrest the action of the whole. Within certain limits, any damage done to individual groups of cells can be repaired by the compensating powers of the organism. It is only when this compensating faculty fails, when the body cannot successfully resist an unfavorable influence, that a disturbance arises which we call disease. This definition enables us to understand how external violence, improper or insufficient food, poisons and other unaccustomed influences, can produce disease. But modern research has rendered it likely that the diseases due to such causes are not so numerous as the affections produced by invasion of the body by parasites.

Of these a few are known to be animals—for instance, the trichina, and some worms found in the blood in certain rare diseases. But the bulk of the hosts we have to contend with is of vegetable nature and belongs to the lowest order of fungi—commonly termed *bacteria*.

Special names have been given to the different subdivisions of this class of microscopic beings—the rod-shaped bacteria being termed *bacilli;* the granular specimens, *micrococci;* while the rarer forms, of the shape of a screw, are known as *spirilla*.

Bacteria surround us from all quarters. The surface of the earth teems with them. No terrestrial waters are free from them. They form a part of the atmospheric dust, and are deposited upon all objects exposed to the air. It is difficult to demonstrate this truth directly with the microscope, for in the dry state bacteria are not readily recognized, especially when few in number. But we can easily detect their presence by their power of multiplication. We need but provide a suitable soil. An infusion of almost any animal or vegetable substance will suffice—meat-broth, for instance, though not all bacteria will grow in the same soil. Such a fluid when freshly prepared and filtered, is clear as crystal, and remains so if well boiled and kept in a closed vessel, for boiling destroys any germs that may be present, while the access of others is prevented by closure of the flask. But as soon as we sow in this fluid a single bacterium, it multiplies to such an extent that within a day the fluid is turbid from the presence of myriads of microscopic forms. For this purpose we can throw in any terrestrial object which has not been heated previously, or we can expose the fluid to the dust of the air. Air which has lost its dust by subsidence or filtration through cotton has *not* the power of starting bacterial life in a soil devoid of germs. Of course, the most certain way of filling our flask with bacteria is to introduce into it a drop from another fluid previously teeming with them.

In a suitable soil each bacterium grows and then divides into two young bacteria, it may be within less than an hour, which progeny continue the work of their ancestor. At this rate a single germ, if not stinted for food, can produce over fifteen million of its kind within twenty-four hours! More astounding even seems the calculation that *one* microscopic being, some forty billion of which can not weigh over one grain, might grow to the terrific mass of eight hundred tons within three days, were there but room and food for this growth!

During their growth the bacteria live upon the fluid, as all other plants do upon their soil. Characteristic, however, of bacteria growth is the decomposition of any complex organic substances in the fluid to an extent entirely disproportionate to the weight of the bacteria themselves. This destructive action occurs wherever bacteria exist, be it in the experimental fluid, or in the solid animal or vegetable refuse where they are ordinarily found. It constitutes, in fact, rotting or putrefaction. The processes of decomposition of organic substances coming under the head of putrefaction are entirely the effect of bacterial life. Any influence, like heat, which kills the bacteria, arrests the putrefaction, and the latter does not set in again until other living bacteria gain access to the substance in question. Without bacteria, no putrefaction can occur, though bacteria can exist without putrefaction, in case there is no substance on hand which they can decompose.

No error has retarded more the progress of the germ theory than the false belief that the bacteria of putrefaction are identical with the germs of disease. The most contradictory results were obtained in experiments made to demonstrate on animals either the poisonous nature, or, on the other hand, the harmlessness, of the fungi commonly found in rotting refuse. But real contradictions do not exist in science; they are only apparent, because the results in any opposite cases were not obtained under identical conditions. The explanation of the variable effects of common putrefaction germs upon animals is self-evident as soon as we admit *that each parasitic disease is due to a separate species of bacteria, characteristic of the disease*, producing only this form and no other affection; while, on the other hand, the same disease can not be caused by any other but its special parasite. It can be affirmed, on the basis of decisive experiments, that the bacteria characteristic of various diseases float in the air, in many localities, at least. Hence rotting material, teeming with bacterial life, may or may not contain disease-producing germs, according to whether

the latter have settled upon it by accident or not. Even if these disease-producing species were as numerous in the dust as the common bacteria of putrefaction, which we do not know, they would be at a disadvantage as far as their increase is concerned. For experience has shown that the germs of most diseases require a special soil for their growth, and cannot live, like the agents of putrefaction, upon any organic refuse. In some cases, indeed, these microscopic parasites are so fastidious in their demands that they cannot grow at all outside of the animal body which they are adapted to invade. Hence if a decomposing fluid does contain them, they form at least a minority of the inhabitants, being crowded out by the more energetically growing forms. In the microscopic world there occurs as bitter a struggle for existence as is ever witnessed between the most highly organized beings. The species best adapted to the soil crowds out all its competitors.

Though the putrefaction bacteria, or, as Dumas calls them, the agents of corruption, are not identical with disease-producing germs, they are yet not harmless by themselves. Putrid fluids cause grave sickness when introduced into the blood of animals in *any quantity*. But this is not a bacterial disease proper; it is an instance of poisoning by certain substances produced by the life-agency of the bacteria while decomposing their soil. The latter themselves do not increase in the blood of the animal; they are killed in their struggle with the living animal cells. The putrefaction bacteria need not be further present in the putrid solution to produce the poisonous effect on animals. They may be killed by boiling if only the poisonous substances there formed remain.

In order to prove the bacterial origin of a disease, two requirements are necessary: First, we must detect the characteristic bacteria in every case of that disease; secondly, we must reproduce a disease in other individuals by means of the isolated bacteria of that disease. Both these demonstrations may be very difficult. Some species of bacteria are so small and so transparent that they can not be easily, if at all, seen in the midst of animal tissues. This difficulty may be lessened by the use of staining agents, which color the bacteria differently from the animal cells. But it often requires long and tedious trials to find the right dye. The obstacles in the way of the second part of the proposition mentioned are no less appalling. Having found a suspected parasite in the blood or flesh of a patient, we can not accuse the parasite with certainty of being the cause of the dis-

ease, unless we can separate it entirely from the fluids and cells of the diseased body without depriving it of its virulence. In some cases it is not easy, if possible, to cultivate the parasite outside of the body; in other instances it can be readily accomplished. Of course, all such attempts require scrupulous care to prevent contamination from other germs, that might accidentally be introduced into the same soil. If we can now reproduce the original disease in other animals by infection with these isolated bacteria, the chain of evidence is complete beyond cavil and doubt. But this last step may not be the least difficult, as many diseases of mankind can not be transferred to animals, or only to some few species.

If we apply these rigid requirements, there are not many diseases of man whose bacterial origin is beyond doubt. As the most unequivocal instance, we can mention splenic fever, or anthrax, a disease of domestic animals, which sometimes attacks man, and is then known as malignant pustule. The existence of a parasite in this affection in the form of minute rods and its power of reproducing the disease are among the best-established facts in medicine. It is also known that these rods form seeds or spores, as they are termed, in their interior, after the death of the patient, which germinate again in proper soil. These spores are the most durable and resisting objects known in animated nature. If kept in the state of spores they possess an absolute immortality; no temperature short of prolonged boiling can destroy them, while they can resist the action of most poisons, even corrosive acids, to a scarcely credible extent.

Another disease, of vastly greater importance to man, has lately been added to the list of scourges of unquestionable bacterial origin. I refer to tuberculosis, or consumption. It is true, this claim is based upon the work of but one investigator—Robert Koch. But whoever reads his original description must admit that no dart of criticism can assail his impenetrable position. Here also a rod-shaped bacillus, extremely minute and delicate, has been found the inevitable companion of the disease. With marvelous patience Koch has succeeded in getting the parasite to grow in pure blood, and freeing it from all associated matter. It must have been a rare emotion that filled the soul of that indefatigable man, when he beheld for the first time, in its isolated state, the fell destroyer of over one-eighth of all mankind! None of the animals experimented on could withstand the concentrated virulence of the isolated parasite. This bacillus likewise produces spores of a persistent nature, which every consumptive patient spits broadcast into the world.

Relapsing fever is another disease of definitely proved origin. If we mention, furthermore, abscesses, the dependence of which on bacteria has lately been established, we have about exhausted the list of human afflictions about the cause of which there is no longer any doubt. Some diseases peculiar to lower animals belong also to this category. The classical researches of Pasteur have assigned the silkworm disease and chicken cholera to the same rank. Several forms of septicæmia and pyæmia have also been studied satisfactorily in animals. Indeed, the analogy between these and the kindred forms of blood-poisoning in man is so close that there can be no reasonable doubt as to the similarity of cause. This assumption, next door to certainty, applies equally to the fevers of childbirth. The experimental demonstration of the parasitic nature of leprosy, erysipelas, and diphtheria is not yet complete, though nearly so. Malarial fever also is claimed to belong to the category of known bacterial diseases, but the proofs do not seem as irreproachable to others as they do to their authors.

The entire class of contagious diseases of man can be suspected on just grounds of being of bacterial origin. All analogies, and not a few separate observations are in favor of this view, while against it no valid argument can be adduced; but it must be admitted that the absolute proof is as yet wanting. Many diseases also, not known to be contagious, like pneumonia, rheumatism and Bright's disease, have been found associated with parasites, the *role* of which is yet uncertain. It is not sophistry to look forward to an application of the germ theory to all such diseases, if only for *the* reason that we know absolutely no other assignable cause, while the changes found in them resemble those known to be due to parasites. In the expectation of all who are not blinded by prejudice, the field is a vast one, which the germ theory is to cover some day, though progress can only continue if we accept nothing as proved until it is proved.

There can be little doubt that in many, perhaps in most instances, the disease-producing germs enter the body with the air we breathe. At any rate, the organism presents no other gate so accessible to germs as the lungs. Moreover, it has been shown that an air artificially impregnated with living germs can infect animals through the lungs. How far drinking water can be accused of causing sickness as the vehicle of parasites cannot be stated with certainty. There is, as yet, very little evidence to the point, and what there is is ambiguous. Thus, exposed from all quarters to the attacks of these merciless in-

vaders, it seems almost strange that we can resist their attacks to the extent that we do. In fact, one of the arguments used against the germ theory—a weak one, it is true—is, that, while it explains why some fall victims to the germs, it does not explain why all others do not share their fate. If all of us are threatened alike by the invisible enemies in the air we breathe, how is it that so many escape? If we expose a hundred flasks of meat-broth to the same atmosphere, they will all become tainted alike and in the same time. But the animal body is not a dead soil in which bacteria can vegetate without disturbance. Though our blood and juices are the most perfect food the parasites require, though the animal temperature gives them the best conditions of life, they must still struggle for their existence with the cells of the animal body. We do not know yet in what way our tissues defend themselves, but that they do resist, and often successfully, is an inevitable conclusion. We can show this resistance experimentally in some cases. The ordinary putrefaction bacteria can thrive excellently in dead blood, but if injected into the living blood-vessels they speedily perish. Disease-producing germs, however, are better adapted to the conditions they meet with in the body they invade, and hence they can the longer battle with their host, even though they succumb in the end.

The resistance or want of resistance which the body opposes to its invaders is medically referred to as the predisposition to the disease. What the real conditions of this predisposition are, we do not know. Experience has simply shown that different individuals have not an equal power to cope with the parasites. Here, as throughout all nature, the battle ends with the survival of the fittest. The invaders, if they gain a foothold at all, soon secure an advantage by reason of their terrific rate of increase. In some instances they carry on the war by producing poisonous substances, in others they rob the animal cells of food and oxygen. If the organism can withstand these assaults, can keep up its nutrition during the long siege, can ultimately destroy its assailants, it wins the battle. Fortunately for us, victory for once means victory forever, at least in many cases. Most contagious diseases attack an individual but once in his lifetime. The nature of this lucky immunity is unknown. The popular notion, that the disease has taken an alleged "poison" out of the body, has just as little substantial basis as the contrary assumption that the parasites have left in the body a substance destructive to themselves. It is not likely, indeed, that an explanation will ever be given on a purely

chemical basis, but in what way the cells have been altered so as to baffle their assailants in a second attempt at invasion is as yet a matter of speculation. Unfortunately for us, there are other diseases of probable bacterial origin, which do not protect against, but directly invite, future attacks.

A question now much agitated is, whether each kind of disease-germs amounts to a distinct and separate species, or whether the parasite of one disease can be so changed as to produce other affections as well. When investigations on bacteria were first begun, it was taken for granted that all bacterial forms, yeast-cells and mold-fungus, were but different stages of one and the same plant. This view has long since been recognized as false. But even yet some botanists claim that all bacteria are but one species, appearing under different forms according to their surroundings, and that these forms are mutually convertible. The question is a difficult one to answer, since bacteria of widely differing powers may resemble each other in form. Hence, if a species cultivated in a flask be contaminated by other germs, accidentally introduced, which is very likely to happen, the gravest errors may arise. But the more our methods gain in precision, and the more positive our experience becomes, the more do we drift toward the view that each variety of bacteria represents a species as distinct and characteristic as the separate species among the higher animals. From a medical stand-point this view, indeed, is the only acceptable one.

A disease remains the same in essence, no matter whom it attacks, or what its severity be in the individual case. Each contagious disease breeds only its own kind, and no other. When we experiment with an isolated disease-producing germ, it causes always one and the same affection, if it takes hold at all.

But evidence is beginning to accumulate that, though we can not change one species into another, we can modify the power and activity, in short, the virulence, of parasites. Pasteur has shown that when the bacteria of chicken cholera are kept in an open vessel, exposed to the air for many months, their power to struggle with the animal cells is gradually enfeebled. Taken at any stage during their decline of virulence, and placed in a fresh soil in which they can grow, be it in the body of an animal or outside, they multiply as before. But the new breed has only the modified virulence of its parents, and transmits the same to its progeny. Though the form of the parasite has been unaltered, its physiological activity has been

modified; it produces no longer the fatal form of chicken cholera, but only a light attack, from which the animal recovers. By further enfeeblement of the parasite, the disease it gives to its host can be reduced in severity to almost any extent. These mild attacks, however, *protect the animal against repetition.* By passing through the modified disease, the chicken obtains immunity from the fatal form. In the words of Pasteur, the parasite can be transformed into a "vaccine virus" by cultivation under conditions which enfeeble its power. The splendid view is thus opened to us of vaccinating, some day, against all diseases—in which one attack grants immunity against another. Pasteur has succeeded in the same way in another disease of much greater importance, namely, splenic fever. The parasite of this affection has also been modified by him, by special modes of cultivation, so as to produce a mild attack, protecting against the graver form of the disease. Pasteur's own accounts of his results, in vaccinating, against anthrax, the stock on French farms, are dazzling. But a repetition of his experiments in other countries, by his .own assistants, has been less conclusive. In Hungary the immunity obtained by vaccination was not absolute, while the protective vaccination itself destroyed some fourteen per cent. of the herds.

Yet, though much of the enthusiasm generated by Pasteur's researches may proceed further than the facts warrant, he has at least opened a new path which promises to lead to results of the highest importance to mankind.

The ideal treatment of any parasitic disease would be to administer drugs which have a specific destructive influence upon the parasites, but spare their host, i. e., the cells of the animal body. But no substance of such virtue is known to us. All so-called antiseptics, i. e., chemicals arresting bacterial life, injure the body as much if not more than the bacteria. For the latter of all living beings are characterized by their resistance to poison. Some attempts, indeed, have been made to cure bacterial (if not all) diseases by the internal use of carbolic acid, but they display such innocent *naivete* as not to merit serious consideration. More promising than this search after a new philosopher's stone is the hope of arresting bacterial invasion of the human body, by rendering the conditions unsuitable for the development of the germs, and thus affording the organism a better chance to struggle with them. Let me illustrate this by an instance described by Pasteur. The chicken is almost proof against splenic fever. This protection Pasteur attributes to the high normal

temperature of that animal, viz, 42° Cent. At that degree of warmth the anthrax bacillus can yet develop, but it is enfeebled. The cells of the bird's body, thriving best at their own temperature, can hence overcome the enfeebled invader. Reduction of the animal's temperature, however, by means of cold baths, makes it succumb to the disease, though recovery will occur if the normal temperature be restored in due time. In the treatment of human diseases, we have not yet realized any practice of that nature, but research in that direction is steadily continuing.

The most direct outcome of the germ theory, as far as immediate benefits are concerned, is our ability to act more intelligently in limiting the spread of contagious diseases. Knowing the nature of the poison emanated by such patients, and studying the mode of its distribution through nature, we can prevent it from reaching others, and thus spare them the personal struggle with the parasite. In no instance has the benefit derived from a knowledge of the germ theory been more brilliantly exemplified than in the principles of antiseptic surgery inaugurated by Lister. This benefactor of mankind recognized that *the* great disturbing influence in the healing of wounds is the admission of germs. It had been well known, prior to his day, that wounds heal kindly if undisturbed, and that the fever and other dangers to life are an accidental, *not* an inevitable, consequence of wounds. But Lister was the first to point out that these accidents were due to the entrance of germs into the wound, and that this dangerous complication could be prevented. By excluding the parasites from the wound, the surgeon spares his patient the unnecessary and risky struggle, giving the wound the chance to heal in the most perfect manner. Only he who has compared the uncertainty of the surgery prior to the antiseptic period, and the misery it was incompetent to prevent, with the ideal results of the modern surgeon, can appreciate what the world owes to Mr. Lister. The amount of suffering avoided and the number of lives annually saved by antiseptic surgery constitute the first practical gain derived from the application of the germ theory in medicine.

FORM AND NATURE OF ACCIDENTS OCCASIONED BY THE ERUPTION OF WISDOM-TEETH.

BY DR. E. MAGITOT, PARIS.

Considered in a general manner, the accidents occasioned by the eruption of a wisdom-tooth are very numerous.

A methodical division of the phenomena is not an easy thing, and very often an accident of a certain nature at the first appearance modifies itself to pass into and through other successive forms.

However, as a classification is necessary to the description, we have adopted the following:

1. Inflammatory accidents, subdivided into accidents of the mucous membrane, and accidents of the bony structures.

2. Nervous accidents, pain in the nerves, troubles in organs of some special sense, and reflex phenomena.

3. Organic accidents, which include the follicular cysts of the wisdom-teeth, the odontomata, and new formations.

First, Inflammatory accidents.

Mucous accidents. — The mucous accidents connected with the eruption of wisdom-teeth are extremely frequent. They commence with a simple irritation of the gums and finish with an abscess, ulceration or gangrene. Sometimes, however, the local accident is isolated, sometimes there is a complication of disturbances of the neighboring parts more or less intense.

In all cases, this mucous form of accidents is, of many, the most common, for in the statistics given by Dr. David of seventy-five accidents due to this eruption, it represents a proportion of seventy observations, which gives in the sum of various accidents the proportion of about 93 per cent.

In the most simple cases, the mucous membrane of the region of the wisdom-teeth is merely lifted, moderately swollen and tender. The accident, without passing unperceived, causes only a slight pain, and the tooth shortly overcoming this obstacle, appears above the gum in the midst of some shreds having about the aspect of proud flesh. The pressure of these shreds, which remain for some time on the chewing surface of the tooth, causes invariably the formation of certain ponches which become filled with foreign matter and debris of food, and thus become true centres of the production of caries.

It is by this process that they cause so premature injuries to wisdom-

teeth to such a degree that some inattentive observers have asserted that wisdom-teeth often erupt in a carious condition.

In a more pronounced stage of the inflammation of the gums, the portions of mucous membrane lying upon the tooth are the seat of a true abscess, at the centre of which the tooth itself is found, which remains thus imprisoned without communication with the exterior. It is to this form of accident that Chassaignac has given the name, *encystment* of the wisdom-tooth, to distinguish it from the preceding form, which he calls encasing.

This distinction, which seems a little too fine, is in other respects wholly artificial; for the first form ordinarily blends with the other, when, after the spontaneous or intentional opening of the abscess, the enclosed tooth finds itself in communication with the outside.

The phlegmonous form consists of a true follicular abscess, and in this case the local accident most commonly extends itself to the neighboring parts. Sometimes it is an inflammation of the gums, which extends forward along the border of the gums and sometimes even to the median line. Sometimes it is an inflammation of a gland, whose particular character is that of extreme persistency as long as the cause remains unknown. Toirac mentions a very remarkable observation concerning it by Dr. Fiard. From the glands, the inflammatory process extends itself to the soft palate and to the pharynx, giving place to an equally obstinate inflammation.

Be it as it may, this form of accidents is altogether peculiar for the inferior and superior wisdom-teeth.

For the inferior jaw, the simple eruption of a tooth, otherwise normal as to volume and direction, may be its cause, while in the upper jaw it produces only that condition when the wisdom tooth is directed abnormally either outside toward the cheek or backwards toward the anterior part of the palate. It is moreover generally to this form that the troubles confine themselves, as we have remarked. To the phlegmonous form which we were indicating, and now and then also to a simple inflammation of the gums, the ulcerous state often succeeds. One sees then on a level with the torn shreds of the mucous membrane, or as a consequence of the opening of the follicular abscess, some irregular ulcerations with grayish bottom, covered with shreds of epithelium, which give the aspect described under the name of ulcero-croupous stomatitis.

The seat of these ulcerations is the region of the border of the gum around it, quite often it is the mucous membrane of the cheek;

more rarely the seat of the ulceration is on the tongue, when the wisdom-tooth has a direction inwards. In every case, the ulcerous variety is that which we have indicated elsewhere in speaking of inflammation of the gums properly, as representing for a certain number of authors, and for ourselves, the true nature of ulcero-croupous stomatitis as occurring among the soldiers and in general among young subjects at the age of the eruption of the wisdom-teeth.

The mucous accidents of wisdom-teeth comprise, then, as one sees, three varieties: the simple inflammation of the gums, the phlegmonous inflammation of the gums, and the ulcerous variety.

But this is not all. In these three varieties, more especially in the two last, there are produced ordinarily some complications in the neighboring parts. The most frequent is the inflammation of the submaxillary gland. It appears almost infallibly when the local inflammatory phenomena take a notable intensity of a certain duration. This adenitis, particularly persistent in the ulcero-croupous form which has been described as occurring among young soldiers as the consequence of the pressure of the collar, or other special cause, appears in our opinion as belonging to the series of accidents of the wisdom-teeth. This glandular inflammation, considered as a complication of an accident of the mucous membrane, will have nevertheless for its exclusive seat the sub-maxillary glands for the inferior jaw and the parotidal glands for the superior. The cervical glands themselves become swollen only when the morbid phenomena have invaded the bony tissues of the jaws. From glandular swelling to inflammation properly there is only one step, and this new complication is very frequent. Here the inflammation appears under the different forms which we have designated as simple oedema, circumscribed abscess, and diffused abscess, according to the extent of the original injury. We may say that in an accident of the mucous membrane the oedematious inflammation is the most common complication.

The phlegmonous form belongs to the cases of severe inflammation of the mucous membrane, or to those particular cases in which an inferior wisdom-tooth finds itself enclosed in the soft parts of the cheek, where it determines ulcerations, indurations and fungous growths, in the midst of which the tooth may be found encased.—*Le Progress Dentaire.*

L. B. Brooks.

NOTCHED TEETH.

In a paper read at the Société de Chirurgie of Paris, M. Magitot, says the "British Medical Journal," lately called attention to the notchings and erosions of the teeth in inherited syphilis, and on the relations of this disease to rickets. He thinks that the notch is not characteristic, and states that it is never found in some races frequently affected by syphilis, such as the Japanese and Peruvians. According to Magitot, not only inherited syphilis, but also all other serious troubles of nutrition, may cause diminution in the number and size of the teeth, or delay in the period of their eruption, but never erosion. Most frequently, the latter is caused by certain nervous affections of early childhood, such as infantile convulsions, especially when accompanied by general debility.—*N. Y. Medical Journal.*

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